

In the Claims

1. (Currently Amended) A resonant reflector for an optoelectronic device tuned to a wavelength, the resonant reflector comprising:

a first material layer having a thickness of an odd multiple of a quarter of the wavelength and also having a first refractive index, the first material layer having one or more patterned regions that extend down into the first material layer thus reducing the thickness of the first material layer in the one or more patterned regions, selected patterned regions being at least partially filled with a second material having a second refractive index, the first refractive index being less than the second refractive index, the second material having a thickness of an odd multiple of a quarter the wavelength; and

a third layer positioned immediately adjacent the first material layer, the third layer having a third refractive index that is greater than the first refractive index.

2. (Canceled).

3. (Currently Amended) A resonant reflector according to claim 6 ~~4~~, wherein the second material also extends above the non-patterned regions of the first material layer.

4. (Currently Amended) A resonant reflector according to claim 6 ~~4~~, wherein the one or more patterned regions reduce the reflectivity of the resonant reflector in those regions.

5. (Unchanged) A resonant reflector according to claim 4, wherein the one or more patterned regions are positioned to provide mode control to the optoelectronic device.

6. (Currently Amended) ~~A resonant reflector according to claim 1, wherein the one or more patterned regions~~ A resonant reflector for an optoelectronic device tuned to a wavelength, the resonant reflector comprising:

a first material layer having a thickness of an odd multiple of a quarter of the wavelength and also having a first refractive index, the first material layer having one or more patterned regions that extend all the way through the first material layer, selected patterned regions being at least partially filled with a second material having a second refractive index, the first refractive index being less than the second refractive index; and

a third layer positioned immediately adjacent the first material layer, the third layer having a third refractive index that is greater than the first refractive index.

7. (Currently Amended) A resonant reflector according to claim 6, wherein the first material is SiO<sub>2</sub>, the second material is Si<sub>3</sub>N<sub>4</sub> or TiO<sub>2</sub>, and the third layer is AlGaAs.

8. (Currently Amended) A resonant reflector according to claim 6 wherein the first material layer is a top mirror layer of a DBR mirror.

9-14. (Canceled)

15. (Unchanged) A resonant reflector for an optoelectronic device, the resonant reflector comprising:

a first mirror region having a top mirror layer, the top mirror layer having one or more patterned regions that extend down into the top mirror layer but not all the way through, and one or more non-patterned regions; and

a second mirror region formed on selected non-patterned regions of the top mirror layer.

16. (Unchanged) A resonant reflector according to claim 15, wherein the one or more patterned regions reduce the reflectivity of the resonant reflector in those regions.

17. (Previously Amended) A resonant reflector according to claim 16, wherein the one or more patterned regions provide a phase shift relative to the non-patterned regions.

18. (Unchanged) A resonant reflector according to claim 16, wherein the one or more patterned regions are positioned to provide mode control to the optoelectronic device.

19. (Canceled)

20. (Previously Amended) A resonant reflector for an optoelectronic device, the resonant reflector comprising:

a top mirror with a top mirror layer, the top mirror layer etched with a pattern down but not through the top mirror layer resulting in one or more patterned regions and one or more non-patterned regions, wherein the one or more patterned regions reduce the reflectivity of the resonant reflector in those regions;

a cap mirror situated above selected non-patterned regions of the top mirror layer.

21. (Previously Amended) A resonant reflector according to claim 20, wherein the one or more patterned regions provide a phase shift relative to the non-patterned regions.

22. (Unchanged) A resonant reflector according to claim 20, wherein the one or more patterned regions are positioned to provide mode control to the optoelectronic device.

23. (Previously Amended) A resonant reflector for an optoelectronic device that has an optical cavity with an optical axis, the resonant reflector comprising:

a resonant reflector layer extending across at least part of the optical cavity of the optoelectronic device, the resonant reflector layer having a refractive index that does not abruptly change laterally across the optical cavity;

the refractive index of the resonant reflector layer including contributions from a first material having a first refractive index and a second material having a second refractive index, at least one of the first material and the second material being a polymer.

24-25. (Canceled)

26. (Previously Amended) A resonant reflector according to claim 23, wherein the first material is confined to a first region and the second material is confined to a second region, the first region and the second region co-extending along an interface, wherein at least part of the interface is not parallel to the optical axis of the optoelectronic device.

27. (Previously Amended) A resonant reflector according to claim 23, wherein the first refractive index is less than the second refractive index.

28. (Canceled)

29. (Previously Amended) A resonant reflector according to claim 23, wherein the first material is AlGaAs and the second material is a polymer.

30. (Unchanged) A resonant reflector according to claim 29, wherein the polymer is polyimide or Benzocyclobuthene (BCB).

31. (Previously Amended) A resonant reflector according to claim 23, further comprising a mirror having a top mirror layer, the top mirror layer positioned adjacent to the resonant reflector layer.

32. (Unchanged) A resonant reflector according to claim 31, wherein the top mirror layer has a refractive index that is greater than the first refractive index and the second refractive index.

33. (Unchanged) A resonant reflector according to claim 32, wherein the top mirror layer is AlGaAs.

34. (Currently Amended) A resonant reflector for an optoelectronic device that has an optical cavity with an optical axis, the resonant reflector comprising:

a resonant reflector layer ~~having~~ defined by two substantially planar opposing surfaces extending across at least part of the optical cavity of the optoelectronic device, the resonant reflector layer having a first region with a first refractive index and a second region with a second refractive index, the first region and the second region co-extending along an interface, at least part of the interface being not parallel to the optical axis.

35. (Unchanged) A resonant reflector according to claim 34, wherein the first region is positioned toward the center of the optical cavity and has lateral edges that are not parallel to the optical axis, and the second region has lateral edges that co-extend along the lateral edges of the first region.

36-44. (Canceled)

45. (Newly Presented) A resonant reflector for an optoelectronic device tuned to a wavelength, the resonant reflector comprising:

a first material layer having a thickness of an odd multiple of a quarter of the wavelength and also having a first refractive index, the first material layer having one or more patterned regions that extend down into the first material layer thus reducing the thickness of the first material layer in the one or more patterned regions, selected patterned regions being at least partially filled with a second material having a second refractive index, the first refractive index being less than the second refractive index; and

a third layer positioned immediately adjacent the first material layer, the third layer having a third refractive index that is greater than the first refractive index.